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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/582,609	09/06/2000	Gunter Fuhr	A33331-PCT	4278

21003 7590 06/19/2002

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EXAMINER

PADMANABHAN, KARTIC

ART UNIT	PAPER NUMBER
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1641

DATE MAILED: 06/19/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/582,609

Applicant(s)

FUHR ET AL.

Examiner

Kartic Padmanabhan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 28-54 is/are pending in the application.
- 4a) Of the above claim(s) 37 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 28-36 and 38-54 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 28-54 are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 7.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Group I in Paper No. 11 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Priority

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

3. The Paul et al. has not been considered because it is not in the English language, and no translation has been provided.

Specification

Content of Specification

- (a) Title of the Invention: See 37 CFR 1.72(a) and MPEP § 606. The title of the invention should be placed at the top of the first page of the specification unless the title is provided in an application data sheet. The title of the invention should be brief but technically accurate and descriptive, preferably from two to seven words may not contain more than 500 characters.
- (b) Cross-References to Related Applications: See 37 CFR 1.78 and MPEP § 201.11.
- (c) Statement Regarding Federally Sponsored Research and Development: See MPEP § 310.
- (d) Incorporation-By-Reference Of Material Submitted On a Compact Disc: The specification is required to include an incorporation-by-reference of electronic documents that are to become part of the permanent United States Patent and Trademark Office records in the file of a patent application. See 37 CFR 1.52(e) and MPEP § 608.05. Computer program listings (37 CFR 1.96(c)), "Sequence Listings" (37 CFR 1.821(c)), and tables having more than 50 pages of text were

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permitted as electronic documents on compact discs beginning on September 8, 2000.

Or alternatively, Reference to a "Microfiche Appendix": See MPEP § 608.05(a). "Microfiche Appendices" were accepted by the Office until March 1, 2001.

- (e) Background of the Invention: See MPEP § 608.01(c). The specification should set forth the Background of the Invention in two parts:
 - (1) Field of the Invention: A statement of the field of art to which the invention pertains. This statement may include a paraphrasing of the applicable U.S. patent classification definitions of the subject matter of the claimed invention. This item may also be titled "Technical Field."
 - (2) Description of the Related Art including information disclosed under 37 CFR 1.97 and 37 CFR 1.98: A description of the related art known to the applicant and including, if applicable, references to specific related art and problems involved in the prior art which are solved by the applicant's invention. This item may also be titled "Background Art."
- (f) Brief Summary of the Invention: See MPEP § 608.01(d). A brief summary or general statement of the invention as set forth in 37 CFR 1.73. The summary is separate and distinct from the abstract and is directed toward the invention rather than the disclosure as a whole. The summary may point out the advantages of the invention or how it solves problems previously existent in the prior art (and preferably indicated in the Background of the Invention). In chemical cases it should point out in general terms the utility of the invention. If possible, the nature and gist of the invention or the inventive concept should be set forth. Objects of the invention should be treated briefly and only to the extent that they contribute to an understanding of the invention.
- (g) Brief Description of the Several Views of the Drawing(s): See MPEP § 608.01(f). A reference to and brief description of the drawing(s) as set forth in 37 CFR 1.74.
- (h) Detailed Description of the Invention: See MPEP § 608.01(g). A description of the preferred embodiment(s) of the invention as required in 37 CFR 1.71. The description should be as short and specific as is necessary to describe the invention adequately and accurately. Where elements or groups of elements, compounds, and processes, which are conventional and generally widely known in the field of the invention described and their exact nature or type is not necessary for an understanding and use of the invention by a person skilled in the art, they should not be described in detail. However, where particularly complicated subject matter is involved or where the elements, compounds, or processes may not be commonly or widely known in the field, the specification

should refer to another patent or readily available publication which adequately describes the subject matter.

- (i) Claim or Claims: See 37 CFR 1.75 and MPEP § 608.01(m). The claim or claims must commence on separate sheet (37 CFR 1.52(b)). Where a claim sets forth a plurality of elements or steps, each element or step of the claim should be separated by a line indentation. There may be plural indentations to further segregate subcombinations or related steps. See 37 CFR 1.75 and MPEP § 608.01(i)-(p).
- (j) Abstract of the Disclosure: See MPEP § 608.01(f). A brief narrative of the disclosure as a whole in a single paragraph of 150 words or less commencing on a separate sheet following the claims. In an international application which has entered the national stage (37 CFR 1.491(b)), the applicant need not submit an abstract commencing on a separate sheet if an abstract was published with the international application under PCT Article 21. The abstract that appears on the cover page of the pamphlet published by the International Bureau (IB) of the World Intellectual Property Organization (WIPO) is the abstract that will be used by the USPTO. See MPEP § 1893.03(e).
- (k) Sequence Listing. See 37 CFR 1.821-1.825 and MPEP §§ 2421-2431. The requirement for a sequence listing applies to all sequences disclosed in a given application, whether the sequences are claimed or not. See MPEP § 2421.02.

Applicant must include headings for relevant sections of the specification, as outlined above.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 28-36 and 38-54 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claim 28 recites the limitations "the focus", "the amplitude", "the light power", "the light beam", and "the particle". There is insufficient antecedent basis for these limitations in the claim. Also, in step a, the recitation of "the focus is vague" because applicant has not specified

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what the focus is of. In addition, the recitation of “distance of the capture area” in step b is vague and indefinite. How can the capture area have a distance?

7. Claim 28 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are the precise manner in which the optically-induced forces are measured or exerted. The claim, as recited is very vaguely worded, and does not allow a reasonable interpretation of exactly what is occurring in the process, Applicant should rewrite the claim in a clearer fashion to convey the exact method steps of the process. Also, how is the particle moved into the capture area by varying field properties? Applicant should recite a clear correlation between the steps of the method and its relation to the preamble of the claim (measurement or exertion of forces).

8. Claim 30 recites the limitation "the positions". There is insufficient antecedent basis for this limitation in the claim. Further, the recitation of “mutual alignment of the positions of the focus” is vague and indefinite because the meaning of this limitation is unclear.

9. Claim 31 recites the limitation "the relationship". There is insufficient antecedent basis for this limitation in the claim.

10. Claims 32-36 are rejected as vague and indefinite because the dependency of the claims is unclear. The claims, as recited, depend from cancelled claim 1. For purposes of this action, the claims are being treated as dependent on claim 28.

11. Claim 32 recites the limitation "the particle diameter". There is insufficient antecedent basis for this limitation in the claim.

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12. Claim 33 recites the limitations "the beam field" and "the associated value". There is insufficient antecedent basis for these limitations in the claim.
13. Claim 34 is rejected as vague and indefinite because it is unclear if the positioning in set positions refers to the capture area or the particles.
14. Claim 35 recites the limitation "the capture quality". There is insufficient antecedent basis for this limitation in the claim. In addition, the recitation of "other calibration properties" is vague and indefinite because this recitation does not allow for the metes and bounds of the claim to be adequately identified. Applicant should recite the precise properties that are to be measured.
15. Claim 36 is rejected as vague and indefinite because it is unclear what the characterization of the particle encompasses. Is the particle being identified, described, etc.?
16. In claims 38-43, applicant should change the dependency to depend only from claim 28, as claim 37 is non-elected.
17. Claim 38 recites the limitation "the electrodes". There is insufficient antecedent basis for this limitation in the claim.
18. Claim 39 is rejected as vague and indefinite because it is unclear if the filed barrier is a part of the optical cage or merely separates the cage from the capture area. Applicant should reword the claim to more clearly identify the arrangement of these components.
19. Claim 40 recites the limitation "the particle movement". There is insufficient antecedent basis for this limitation in the claim.
20. Claim 41 is rejected as vague and indefinite for the recitation of a particle size "below 200uM" because this encompasses a size of 0, which is impossible.

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21. Claim 43 recites the limitation "the transitional movement". There is insufficient antecedent basis for this limitation in the claim. In addition, the recitation of adjusting the optical cage is vague and indefinite because the manner in which the cage is adjusted has not been recited.

22. Claim 44 recites the limitations "the focus" and "the movement". There is insufficient antecedent basis for these limitations in the claim. In addition, the recitations of the microelectrode arrangement set up to form an electrical field and an illuminating device set up to form an optical cage are vague and indefinite because the manner in which they are set up to accomplish their recited function has not been recited in the claims. Also, applicant should change "an" to "a" in the next to last line of the claim. Further, applicant must recite in the claim the way in which the monitoring or detection device can be used to measure particle movement. It also appears that the device, as claimed, cannot carry out the recited function of the device, as there appears no mechanism to exert forces on the particle, but only to measure forces.

23. Claim 46 recites the limitation "the thickness". There is insufficient antecedent basis for this limitation in the claim. In addition, the recitation of "less than 500 μM " is vague and indefinite because this limitation encompasses a size of 0, which would render the substrate non-existent.

24. Claim 49 recites the limitation "the x,y, and /or z direction". There is insufficient antecedent basis for this limitation in the claim. Applicant should also change "claims" in line 1 of the claim to "claim" and "a multiple field" in line 2 to "multiple fields". In addition, The recitation of "set up" is vague and indefinite because the way in which the electrodes are set up to create multiple fields has not been recited.

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25. The term "numerous" in claim 49 is a relative term which renders the claim indefinite.

The term "numerous" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

26. Claim 50 recites the limitation "the suspension liquid". There is insufficient antecedent basis for this limitation in the claim. Also, in order to maintain consistent terminology, applicant should insert "fluid" before "microsystem".

27. Claim 52 is rejected as vague and indefinite because applicant has not recited the methods used to make the device, but has only referred to a generic group of methods, which do not allow for the scope of the claim to be adequately identified. Applicant must recite the exact methods that are used to construct the electrodes.

28. Claims 53 and 54 are rejected as vague and indefinite for improper dependency, as they depend on cancelled claims. They are being treated as depending on claim 28.

29. Claims 53 and 54 provide for the use of the claimed method, but, since the claims do not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claims 53 and 54 are rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process, i.e., results in a claim which is not a proper process claim under 35 U.S.C. 101. See for example *Ex parte Dunki*, 153 USPQ 678 (Bd.App. 1967) and *Clinical Products, Ltd. v. Brenner*, 255 F. Supp. 131, 149 USPQ 475 (D.D.C. 1966).

Claim Rejections - 35 USC § 102

30. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

31. Claims 28-30, 32-36, 39-44, and 53-54 are rejected under 35 U.S.C. 102(b) as being anticipated by Morishima et al. (1997). The reference discloses a microchannel system for the screening of *E. coli*, wherein the bacteria are manipulated by dielectrophoretic force and radiation pressure of a laser tweezer (abstract). The technique of the reference combines optical trapping and electric forces for the manipulation of particles and isolation of one particle. The microelectrodes of the device of the reference induce migration of the bacteria, and the *E. coli* are three-dimensionally optically trapped at the focal beam of the laser beam, which is within the electrode arrangement. By controlling the magnitude of the electric field, unneeded bacteria are dispersed (p. 156). In addition, with the use of a laser manipulator, the bacteria can be manipulated as desired. According to the reference, the focal point can be moved arbitrarily with two degrees of freedom, wherein the trapped objects follow the focal point (page 158). The distance between the focus and capture area may still be varied and measured, if desired. The characteristics of each *E. coli* are dependent on optical recognition using fluorescence microscopy (p. 157). As seen in Figures 2 and 3, pairs of electrodes are spaced from each other on a substrate.

Claim Rejections - 35 USC § 103

32. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

33. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

34. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

35. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morishima et al. (1997) in view of Svoboda (1994).

Morishima et al. teach the use of electric fields and laser tweezers, as previously discussed. However, the reference does not teach the calibration of the optical cage.

Svoboda teaches force calibration wherein laser light in a focused beam is directed towards a particle which forces fluid past the stationary particle. The fluid drag force is balanced by the trapping force, thereby calibrating the cage (pages 267-268).

It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to calibrate the optical cage as taught by Svoboda with the method of Morishima et al. because calibration allows for more accurate and meaningful results.

36. Claims 38 and 45-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morishima et al. (1997) in view of Fuhr et al. (1994).

Morishima et al. teach the use of electric fields and laser tweezers, as previously discussed. However, the reference does not teach the manner in which the microelectrodes are constructed or the arrangement of the electrodes.

Fuhr et al. teach cell manipulation and cultivation under the influence of an electric field. The electrode array of the reference allows for the application of high-frequency electric fields into cell suspensions. The micro scaled electrode structures were manufactured on glass or silicon using semiconductor technology (abstract). The electrodes were made of gold. Four electrodes were spaced apart on the surface of a glass chip (substrate). The electrodes were also optionally coated with thin dielectric layers.

It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to use the arrangement of electrodes and method of manufacture taught by Fuhr et al. with the method and device of Morishima et al. because Fuhr et al. teaches that their electrode system allows for electric fields that can be used in original cell culture media, such as the E. coli suspensions of Morishima et al. In addition, one could have easily used the manner in which the

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electrodes were made and arranged of Fuhr et al. with the method and device of Morishima et al. with a reasonable expectation of success. The electrodes of Fuhr et al. were made using conventional technology and materials

Conclusion

Claims 28-36 and 38-54 are rejected.

References: Itoh et al. and Weetall et al. are cited as art of interest for teaching optical tweezers.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kartic Padmanabhan whose telephone number is 703-305-0509. The examiner can normally be reached on M-F (8:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on 703-305-3399. The fax phone numbers for the organization where this application or proceeding is assigned are 703-746-5207 for regular communications and 703-305-3014 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0196.

Kartic Padmanabhan
Patent Examiner
Art Unit 1641

June 16, 2002



CHRISTOPHER L. CHIN
PRIMARY EXAMINER
GROUP 1800-1691